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WELL TESTING PLAN FOR THE SCIENTIFIC OBSERVATION HOLE PROGRAM, KILAUEA EAST RIFT ZONE, HAWAII

TASK 3 REPORT

for

THE UNIVERSITY OF HAWAII

Honolulu, Hawaii

by

GeothermEx, Inc.
Richmond, California

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1. INTRODUCTION

The purpose of this manual is to provide operational guidelines for the testing of the Scientific Observation Holes (SOHs) to be drilled in the Kilauea East Rift Zone, Hawaii. The wells are being drilled primarily for scientific observation purposes, and may not be flow-tested or produced. The information to be gained from the SOHs will provide an assessment of subsurface geological conditions, groundwater level and composition, temperature, drilling conditions, an inventory of possible mineral and geothermal resources, and an eruptive history of the island to the depth drilled.

By injecting water into the holes, estimates can be made as to reservoir conditions and productivity. The wells will be completed as injection wells to allow pressure transient tests to be conducted on the geothermal reservoir. The main aim of the testing is to determine reservoir properties such as flow capacity and storage capacity. The SOHs, in combination with existing geothermal wells or geothermal wells to be drilled by producers in the future, can be instrumented and used for interference testing to provide further quantitative data on the reservoir hydraulic properties.

The SOHs will be drilled in areas not tested before by deep drilling, to a nominal depth of approximately 4,000 feet, which is the depth at which the top of the geothermal reservoir was encountered in the vicinity of the HGP-A well. The holes are scheduled to be drilled through possible geothermal cap rocks and may penetrate into fractures connecting with the reservoir. Therefore, they may be drilled to

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shallower or deeper depths than 4,000 feet. The drill rigs contracted to do the drilling will have the capability of drilling to depths of approximately 6,500 feet.

This manual is divided into three parts: a) guidelines for completion testing of the SOHs, including short-term injection testing; b) guidelines for the long-term reservoir interference test involving water injection into the SOHs and monitoring of pressure changes in surrounding selected observation wells; and c) guidelines for flow testing, in case the wells can flow.

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2. GUIDELINES FOR COMPLETION TESTING

2.1 Introduction

Following completion of each SOH, a short series of tests will be conducted. The purpose of the short tests is to identify the location of the permeable zones and to obtain an initial estimate of the transmissivity and skin factor of the well. Some of these tests will involve the drilling rig's equipment, such as the mud pumps, which have a capacity similar to the injection rate required during long-term injection tests. It is also important to conduct these tests while the rig is still available at the site, in case further work is required on the well (i.e., cleaning, deeper drilling, fishing, etc.).

2.2 Test Procedure

The following procedure should be followed for each SOH at the time of completion.

1. Once the slotted liner is set at the bottom, proceed to flush the mud inside the hole by circulating with water. After circulation is lost or after water returns to the surface, wash the well with a cleaning jet tool to ensure mud cake removal utilizing, if possible, a mud-breaking agent.

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2. Pull the drill pipe out of the hole while maintaining a small but constant cold water inflow (30-50 gpm) through the kill line valve on the casing head.

3. Insert a joint of drill pipe inside the hole and close the annular BOP against the pipe. Attach the wireline lubricator to the upper section of the pipe, using a thread adaptor.

4. Unscrew the bullnose portion of the Kuster temperature tool and attach the rigid tandem joint provided to run two tools and two sinker bars in tandem. Load the temperature and pressure tools with charts and wound-up six-hour clocks; insert through the joint of drill pipe and screw the lubricator back in place.

5. Run a temperature/pressure profile of the entire well while continuing to pump at a constant rate of 30-50 gpm, making five minute stops every 100 feet within the cased portion of the hole and every 50 feet below the casing shoe. Use six hour clocks in the Kuster tools. Pull the tools out of the hole at the end of the survey and recover the charts. Further surveys may be conducted depending on the results from the first run.

6. Fill up the rig's mud and water tanks with fresh water (a minimum of 10,000 gallons of water must be kept in storage for the injection test).

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7. Put a new chart in the pressure tool; use a fresh six-hour clock and set the tool halfway between the casing shoe and bottom hole.

8. Upon reaching the measuring depth, use the rig pumps to pump cold water, using the following schedule: 75 gpm for the first 20 minutes, 100 gpm for the next 20 minutes, and 300 gpm for the last 20 minutes.

9. After injecting 300 gpm (or maximum pump flow rate) for 20 minutes, the well is to be shut-in and pumping stopped. The pressure bomb is to be left at the measuring depth for the remainder of the clock time in order to record the pressure falloff.

10. After the clock has stopped, the pressure bomb is to be recovered and the results interpreted on site.

11. Close well in.

For the wells completed in zones with relatively low permeability, the following additional points need to be considered:

1. Caution must be taken while testing to avoid overpressurizing the open formation and creating a fracture connecting the open hole to the cemented zones above. Therefore, the cold water pumping operation described in item 8 may require considerably

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lower flow rates, and a pressure gauge shall be installed at the wellhead, attached to one of the side valved outlets of the casing head.

2. Wellhead pressure should not exceed 500 psi to avoid formation fracturing.

3. The injection flow rate schedule for these wells will be calculated at the site by the testing engineer, based on observation of the formation behavior during the course of drilling.

2.3 Additional Tests

After completion of the tests described in section 2.2, additional injection tests may be required depending on the results. The need for additional tests will be at the discretion of the testing engineer on site.

After the injection tests are completed, the temperature and pressure recovery of the well should be monitored by running downhole temperature and pressure logs, using the Kuster tools on site, on a regular basis. The logs should be run at the following times; a) immediately after the injection tests are completed; b) one day shut; c) three days shut and; d) six days shut. Additional surveys may be run after six days.

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3. GUIDELINES FOR LONG TERM INJECTION TESTS

3.1 Introduction

Figure 3.1 shows the typical well completion for each SOH. After completing each well, a long-term injection test will be conducted while monitoring surrounding observation wells for any pressure interference. The test will start after the pressure in the well has been allowed to stabilize.

During the course of the long term injection tests, a flow rate of approximately 475 gpm will be injected into each SOH through the master valve for a period of approximately 30 days. The downhole pressure will be monitored separately in each of the instrumented observation wells and, if possible, in the injection well. In addition to monitoring downhole pressure responses, temperature surveys may be conducted in selected adjacent wells at regular intervals to monitor for any temperature decline associated with the injection.

At the end of the injection test, the pressure recovery both in the injection and monitor wells will be monitored for a period of approximately ten days, before removing the equipment and installing it for the next injection test.

The downhole pressure data from the observation wells will be collected initially on a five minute and later on an hourly basis. As the test progresses, the monitoring interval may be changed at the discretion of the testing engineer.

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The equipment to be used to monitor downhole pressures during the long-term injection test consists of capillary tubing and a downhole pressure chamber installed in each well and connected to a temperature compensated surface pressure transducer and automatic data logger. The tubing is filled with helium gas, and the surface pressure reading is therefore very close to the downhole pressure at the depth where the pressure chamber is installed. A permanent stock of helium bottles with their respective 0-1,500 psi pressure regulators will be kept on site to allow the capillary tubing to be purged on a regular basis.

Three sets of high-precision downhole pressure loggers, capillary tubing, valving and downhole chambers are available. Also, a Barton differential pressure recorder with an orifice plate that adapts to the injection line will allow a continuous record of the water flow rate being pumped into the injection well.

Water will be pumped continuously to a regulation tank located above the wellhead level. The tank will be connected to a six-inch valve and manifold to allow isolation and flow by-passing in case repairs are required. Flow coming into the tank will be regulated first by using a six-inch butterfly valve located in the mainline close to the tank or simply by adjustment at the water source.

From the tank, water will flow by gravity to the well, being treated as required. At the inlet of the well to be tested, a six-inch master control valve will be installed. An orifice plate with a Barton differential pressure recorder will be used to record the flow rate injected into the well.

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3.2 Test Procedure

1. Nipple up six-inch flange to the six-inch gate valve of the SOH to be tested.

2. Connect the injection line manifold to the wellhead master valve. Install the flange/orifice plate set and the Barton flow recorder at a location defined by the testing engineer. Connect the injection line to the injection well manifold.

3. Measure the depth of the water table surface inside each monitor hole before installing the downhole equipment, using either a water table meter or, in wells under pressure, a Kuster pressure gauge.

4. Install the wellhead flange and three-inch ball valve in the monitor holes. Connect the bull plug pack-off assembly and sheave for the capillary tubing.

5. Install downhole chambers and capillary tubing in each well using the mechanical hoist. Each reel of tubing contains a usable length of some 4,000 feet. The downhole chamber should be set at least 1,000 feet below the water level in the observation wells and, if it is possible to monitor the injection well, as close as possible to the first permeable feed-zone of the injection well.

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6. Attach the tubing safety clamps to the tubing and record the exact depth of the lower end of the chamber. Unload the tubing reel from the mechanical hoist and check the tightening of the safety clamps.

7. Connect the pressure meter and data logger to the high pressure system; isolate the transducer by closing the stem valve and attach the helium pressure regulator to the tubing.

8. Set the pressure regulator on the helium bottle to the minimum pressure that will be required to purge the capillary tubing. The required pressure will be calculated for each well by the testing engineer.

9. Purge the tubing/chamber system with helium and use a soap solution applied to the connections to check for any major leaks.

10. Open the valve on the data logger side and slowly open the valve on the tubing side, being careful to prevent any pressure surges.

11. Program the data logger to monitor pressure readings initially every hour unless directed otherwise by the testing engineer (a detailed procedure on how to operate the data logger is given in the Appendix).

12. Monitor pressures for two to three days; if gas leaks are suspected, perform a pressure leak test by closing the valve to

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the data logger and purging the system at 2,000 psi. Repair leaks if found at the surface. If problems persist due to leaks below the surface, perform a two minute purge and allow the pressure to re-stabilize before taking pressure readings with the data logger.

13. Daily readings will be entered into the computer file for each well and the hard data will be faxed to GeothermEx on a weekly basis.

After the pressure monitoring equipment is tested and while recording of downhole pressures is occurring, the actual start up of the injection test will begin using the following procedure:

1. Fill up the injection line with fresh water and check the full line length for leaks.

2. Start up the pump and regulate flow to the specified level to deliver 475 gpm.

3. Observe pressure and pump performance for the first three hours; allow the water to flow to surface drainage until the line from the pump to the tanks is thoroughly cleaned.

4. Fill up the regulation tank and check for leaks.

5. Fill up the pipeline from the tank to the well's flow control valve, located upstream from the orifice meter.

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6. Open the by-pass valve until the line is thoroughly cleaned. Allow fluid to flow to surface drainage for a minimum of one hour, while observing the level changes in the tank to estimate the flow rate.

7. Open the well's master valve and the six-inch line valve. Log the exact time on the Barton recorder's circular chart. Injection should not begin until two or three days of downhole pressure monitoring has occurred.

8. The initial injection flow rate should be 10 gpm and this is to be maintained for 12 hours to allow the well to cool down. After the 12 hour period, injection at 475 gpm or the maximum flow rate that the well can accept can begin.

9. If capillary tubing is installed in the injection well, the tubing should be purged continuously for the first ten minutes after injection starts to ensure that water does not enter the capillary tubing from the downhole chamber.

10. Log the downhole pressure changes in both the injection and observation wells every five minutes for the first 24 hours. Purge the capillary tubing at the required pressure before every reading during the first three hours.

11. Observe flow rate changes using the Barton recorder. Once the flow appears to be stable, regulate the flow into the well at 475 gpm or the maximum stable flow rate that the well will accept.

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12. Observe level changes in the tanks and maintain level by throttling the six-inch main line gate valve.

13. Adjust pump to desired level in order to deliver the required flow rate to the well.

14. After the initial 24 hour period, log the downhole pressures in the injection and observation wells on an hourly basis. The tubing should continue to be purged on a weekly basis. This schedule may be changed at the discretion of the testing engineer.

15. Carry out the injection for a period of approximately 30 days. If repairs are necessary in the regulation tank, isolate it from the system by use of the valve in the by-pass manifold. Avoid stopping the injection into the well as much as possible. If a complete system shut-off is inevitable, open the by-pass manifold to drain to the ground, shut off the three-inch valve at the wellhead first, followed by the three-inch valve at the main line, close to the pump. Leave all other valving open. If repairs to the line are to be done, isolate the portion to be repaired and fill line and test with water after the repairs have been made. Start up procedure should be identical to the one described above.

16. After 30 days of testing, and depending upon the observation results, stop injection and monitor the pressure recovery in the system. The pressure readings should be taken in the

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injection and observation wells at five minute intervals for the first 24 hours after shut-in and then hourly for the rest of the test. The schedule may be changed at the discretion of the testing engineer. The pressure recovery after the injection stops, should be monitored for a minimum of ten days. The data shall be retrieved from the data logger on a daily basis the first three days, and weekly for the rest of the test period.

17. Pull the downhole assemblies out of the injection and observation wells and prepare for the next test.

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4. FLOW TEST GUIDELINES

4.1 Introduction

As discussed in Chapter 1, the SOHs are designed to investigate and test the zone near the top of the geothermal reservoir within the East Rift Zone. The wells will be completed as shown in figure 3.1 and used for injection testing as described in Chapter 3. If the wells are allowed to flow, testing procedures must be outlined to measure various flowing parameters and estimate reservoir properties. This chapter provides guidelines on the equipment required and the procedure to be followed if flow testing occurs.

4.2 Flow Rate Metering

The flowing parameters of the well will be measured utilizing the basic well test setup shown on figure 4.1. The flow from the well will be diverted at the wellhead through a blow-down line. A metering orifice plate in the middle of the blow-down line serves the purpose of measuring the flow parameters and controlling the wellhead pressure. Sampling ports will be located near the wellhead and at points upstream and downstream of the orifice plate.

The use of two orifice sizes during the testing will enable chemical samples to be obtained at two different flow rates and pressures. Testing will be temporarily stopped to change orifice plates. Changing of orifice plates will occur near the end of the short

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term well test. The type of data required for confirmation of the well's chemical characteristics necessitates the use of dual flowing pressures.

Samples of the gas and/or liquid phases will be collected at the sampling ports in the flow line (figure 4.1) for chemical analysis. The enthalpy of the total flow will be calculated from the results of measurements at the James tube and weir box. A second set of enthalpy measurements will be obtained from the results of measurements at the James tube and the orifice differential pressure. A third set of enthalpy values will be calculated from the results of sampling and measuring the gas:steam ratio upstream and downstream of the orifice plate. A more detailed discussion on the gas and fluid sampling procedure is given in the Task 2 report.

At the end of the blow-down line, a discharge pipe, better known as a James tube, is attached (figure 4.1). This pipe is specifically designed for measuring the discharge pressure, which is used to calculate the total flow rate (steam + liquid) discharged from the well.

The James tube discharges the flow eccentrically into the atmospheric separator. In this separator, the liquid and the steam phases are separated at atmospheric conditions. The saturated steam is discharged to the atmosphere, and the saturated liquid is discharged into the weir box, where the flow rate of the liquid fraction is directly measured. The outflow from the weir will be channeled and

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directed to flow to the sump pit. The atmospheric separator also serves the purpose of reducing the noise level produced at the discharge pipe.

Three orifice plates of different diameters shall be available for use in combinations with either of two different diameters of James discharge tube. The optimum combination of orifice plate and discharge tube diameter will be defined at the well site. This decision will depend on:

- the range of differential pressure values measured across the orifice;
- the existence of critical flow conditions at the lip pressure tap;
- the smoothness and quality of the production data; and
- the pressure requirements at chemical sampling parts.

The weir box design includes three baffle plates near the middle of the box to eliminate flow pulsation from the outlet of the silencer.

A Barton two-pen recorder, equipped with a sealed sensor system consisting of a high range differential pressure sensor and a low range static pressure sensor, will be used to monitor the total flow rate data. This will consist of the differential pressure across the orifice and lip pressure. Water level and temperature data at the weir box will

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be obtained manually. Flow line temperature and pressure taps are located at points where these measurements are needed either for flow metering or chemical sampling purposes. The pressure monitoring ports shall have one-inch, high temperature-rated ball valves installed to allow isolation of the meters for calibration of the bourdon gauges. A hydraulic dead-weight tester will be available to check and maintain calibration of the pressure instruments. The temperature metering ports shall have installed thermowells for the thermistor probes which will be used with the digital temperature indicator and the automatic data logger. The orifice upstream pressure and James lip pressure taps also will be set-up to install the automatic data logger. The analog gauges however, will still be used as a backup metering system.

A hydrostatic test of the facility must be conducted once the blow down line has been assembled and prior to installation of the James discharge tube. A blind flange will be installed at the end of the blow-down line and the entire system filled with cold water. Pressure metering instruments will be isolated by means of ball valves. The pressure will be increased to 300 psig using a hydraulic hand pump connected to the system drain valve located upstream of the orifice plate. All flanged and threaded connections shall be inspected for leaks. The system will have to maintain the pressure for 15 minutes with less than a 10% pressure decline. Corrective action will be taken if leaks are detected or if the pressure decline exceeds 10%.

The weir box will be filled with water to the level of the notch angle. The level of the water in the bottom of the weir notch will be marked. This point will be the reference level for crest height

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measurements during the test. This procedure will be repeated every time the testing system is assembled.

The Barton recorder will be zeroed, time-adjusted and calibrated as necessary. The dead-weight tester will be used to check the Barton recorder for calibration.

4.3 Test Procedure

After the instrumentation and equipment has been installed, checked and calibrated as necessary, the flow testing of each SOH can be initiated. The following steps will be followed during the well test.

1. Wellhead pressure will be monitored for a period of time prior to beginning the flow test.

2. Install the lubricator base on the 3-inch top lubricator valve of the wellhead. Prepare the Kuster temperature and pressure tools for tandem temperature/pressure logging in the well under static conditions. A six hour clock will be used in each tool.

3. Close the 3-inch 600 series side valve. Open the 3-inch master valve and the 3-inch lubricator valve. Lower the Kuster tool and record the temperature/pressure logs. The tool will be held for five minutes of continuous logging at 100-foot intervals within the cased hole and 50-foot intervals below the casing shoe. Withdraw the tool from the well after logging to total depth. Shut-in the well and interpret the

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temperature/pressure charts. Repeat the logging operation if the log quality is unsuitable. Monitor wellhead pressure and temperature during logging operations.

4. The flow test will be started by first opening the master valve. Open the side valve slowly until it is 100% open. If the well does not flow, pressurize overnight to 300 psi. Repeat the pressurization process by increasing the wellhead pressure by 100 psi on each attempt until the well flows. The wellhead side valve must be opened as quickly as possible if the well has to be stimulated to induce flow.

5. After the well has begun to flow, monitor and record data on an hourly basis for the first 10 hours at the following locations:

   - Wellhead pressure
   - Wellhead temperature
   - Upstream orifice pressure
   - Upstream orifice temperature
   - Differential pressure across the orifice
   - Lip pressure
   - Weir crest height

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- Weir box temperature

The frequency of data collection may be changed according to the well flow response.

6. Collect chemical samples as required (see Task 2 report for details).

7. Flow well at maximum valve opening for the desired flow period.

8. If possible, a downhole temperature/pressure log will be made while the well is flowing. Prepare the Kuster tools using six hour clocks.

9. Install the Kuster tool and sinker bars in the lubricator. Slowly open the 3-inch lubricator valve and lower the tool to a depth of 200 feet. Attach a tension meter to the casing head using a lightweight chain and sheave. Measure the wireline tension as the tool travels downhole and at each continuous logging station. Continuous five minute measurements will be made at the same depths as the static survey. Throttle the well using the side valve and slowly pull the tool out of the well if the wireline loses tension. Repeat the log using new charts in the Kuster tool at one half of the previous flow rate. Increase the flow rate until a stable and smooth flow is obtained should surges in well flow occur at the lowered rate. Monitor the wellhead pressure, upstream orifice pressure,

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differential pressure across the orifice, lip pressure and weir flow every 15 minutes during logging operations.

10. A spinner survey of the well during flowing conditions will be made should a spinner tool be available.

11. After obtaining a satisfactory flowing survey, reload the Kuster tools with 12-hour clocks and charts. Check the tool's lead screws and ensure that the chart carrier slides easily.

12. Prepare for pressure build-up test.

13. Position the Kuster tools below the flash point within the well. This elevation can be determined from the previous log. Position the tools at the bottom of the liner if the logs recorded under flowing conditions show that water is flashing within the formation.

14. Shut-in the well, closing as quickly as possible the 3-inch side valve. Monitor the wellhead pressure at one-minute intervals for the first 15 minutes, every five minutes for the next 45 minutes, every 15 minutes for the next three hours and every hour for the next eight hours. Retrieve the Kuster tools from the well and interpret the charts.

15. Disassemble the flow metering instrumentation. Clean and check calibration of the pressure gauges using the dead weight

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tester. Check calibration of the temperature gauges by sending the Kuster tool to the manufacturer.

16. Transport and assemble the equipment and instrumentation to the next well.

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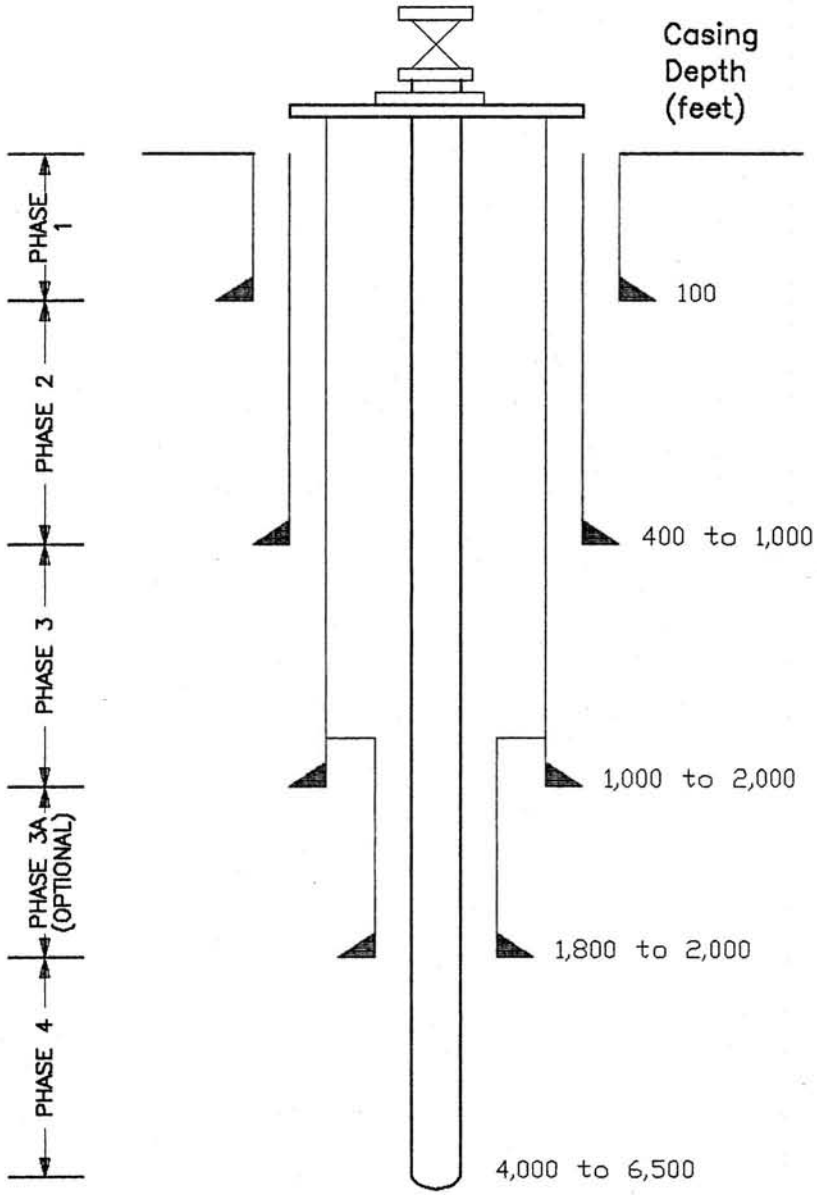
FIGURES

Figure 3.1 Typical SOH Completion Diagram



Hole Diameter	Casing Program
16.5 inches	13–3/8 inch, K–55, 61 lb/ft Butt–welded casing
5.35 inch cored hole, enlarged to 12.5 inches using hole opener	9–5/8 inch, K–55, 40 lb/ft Buttress threaded casing
5.35 inch cored hole, enlarged to 8.5 inches using hole opener	6–5/8 inch, L–80, 32 lb/ft Buttress threaded casing
5.35 inch cored hole	CHD–134 drilling rods
3.85 inch (HQ) cored hole or 3.04 inch (NQ) cored hole	2–3/4 inch, 4.4 lb/ft NQ drilling rods

 UHFIG31/012190/H2369

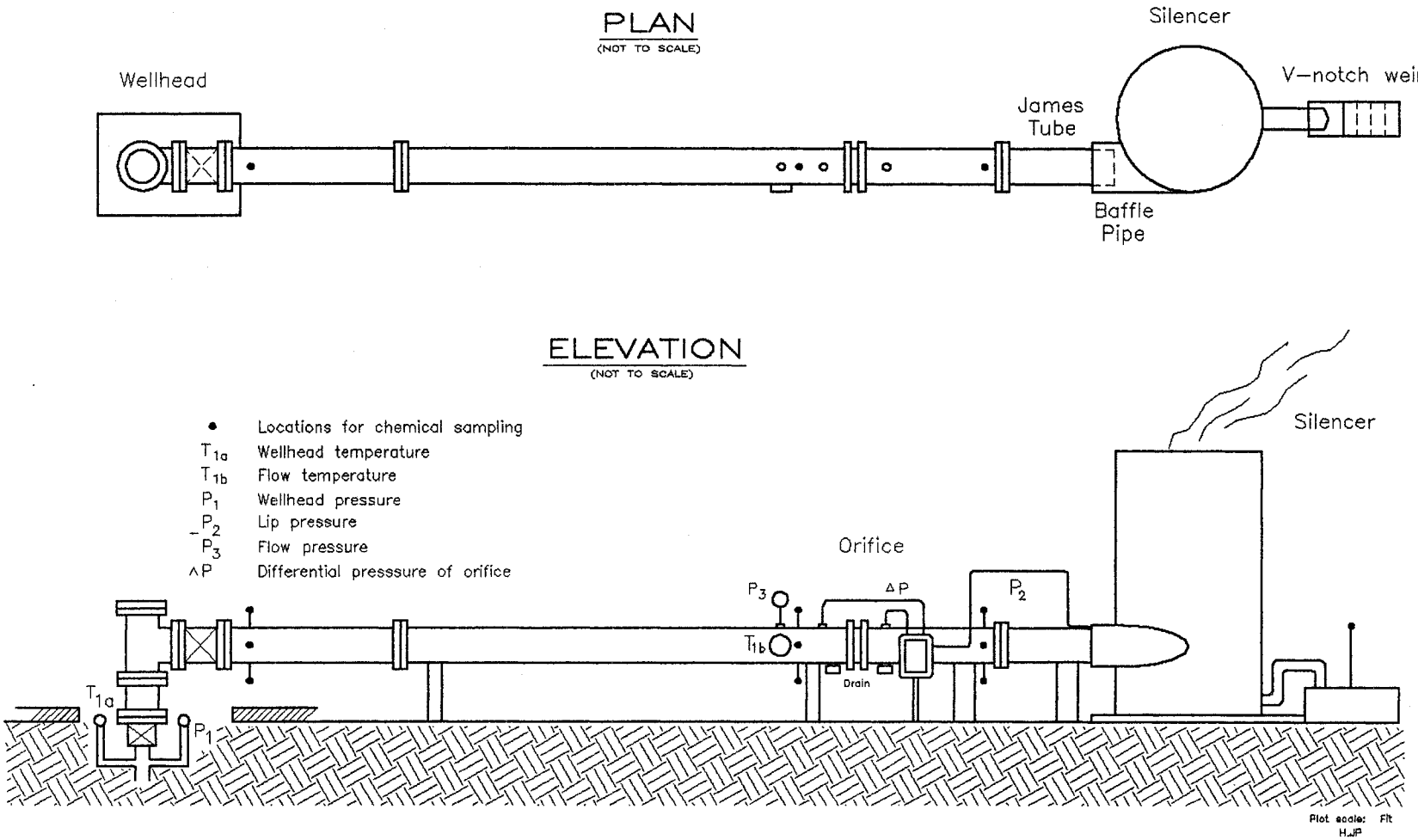


Figure 4.1 Well test setup for James lip pressure method.

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APPENDIX

INSTRUMENTATION INFORMATION

PRUETT MINI-MAX DATALOGGER PROGRAM

Operations Manual

October 20, 1989

PRIMARY INSTALLATION PROCEEDURE

Pruett Mini-Max Program

1. Be sure the clock time and date on your PC computer is correct. This will set the time and date in the data logger when the initial file is retreived and stored.

2. Run a bench test by creating an initial practice file before actual data retreival in a field situation, to insure correct operation of logger and software. Follow the operations manual, and enter the values and settings which will be used in the field. When ready to set up for the actual tests, all parameters will have been set.

3. When the practice file has been DOWNLOADED, check the screen display (example below) to insure the Datalogger clock------ --- was fixed! -- to the correct time.

```
Warning -file type is not used

Calling Station "PRUETT"

*1A
 R+8.0000 F+7.0000 V3 E00 00 M48 A1 L+8.0000 C2427
*1G
 A1 L+1.0000 C0826
*7F
C
 Y00 D0000  T00:01:24 C1257
*10/20/89 14:51:28 Datalogger date (  0) needs fixed!
89:293:14:51:28C
 Y89 D0293  T14:51:29 C2115
*10/20/89 14:51:30 Datalogger clock ( 0:01:24) was fixed!
E
Next time for "PRUETT" is 10/20/89 14:52:00
Press a key to continue...
```

4. You may CONVERT the practice file to check this program function, but be sure to delete the PRUETT.D1 and the Datalog.C1 files from your disk directory, so your actual field files will begin with #1 in the sequence.

5. The Mini-Max is a continuously active device. If it is not being used for data logging, store with power disconnected. See the technical notes sheet for location of power plug in the Mini-Max.

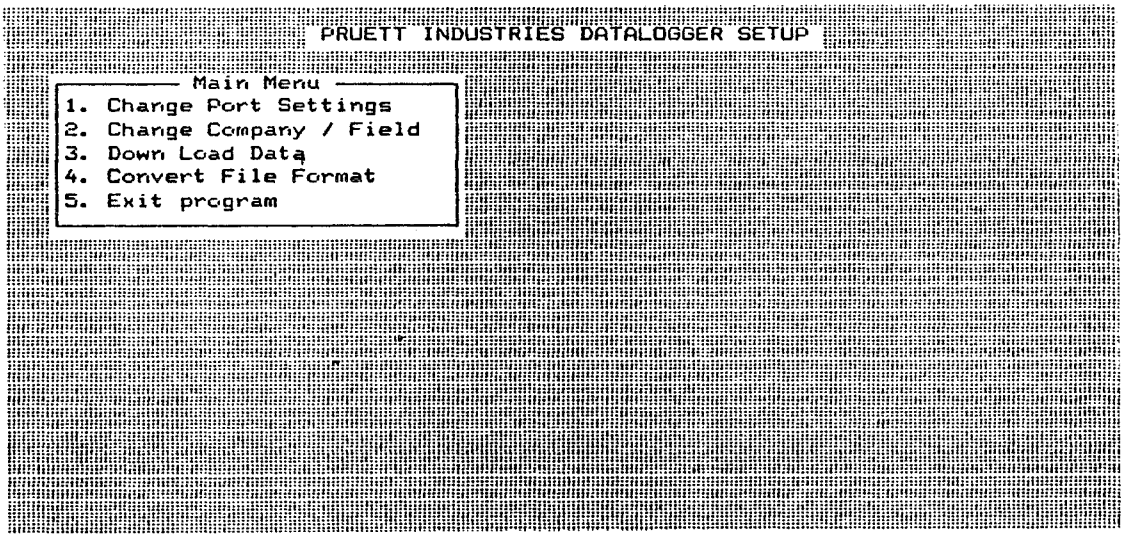
NOTE: When the power supply has been turned off, all previous data and settings are ereased and the logger must again go through this inital set-up proceedure.

MM - DATALOGGER RECORDING PROGRAM

The MM program is used for data aquisition from the Pruett Mini-Max Logger, through the COM 1 RS232 serial port. It operates on most IBM compatible computers using MS DOS. A color monitor or monochrome graphics monitor should be used. The MM.EXE program and additional operations files will be included on the disk supplied with this manual. These files may be copied to another disk drive for more file storage space when ready to run the program.

Enter MM to begin program.

The screen will display the Main Menu.



Selections from each menu can be made using the appropriate number selection and ENTER , or by moving the highlighted bar with the up or down arrow keys to the correct option and ENTER.

NOTE: Use the ESC key to return to previous menus.

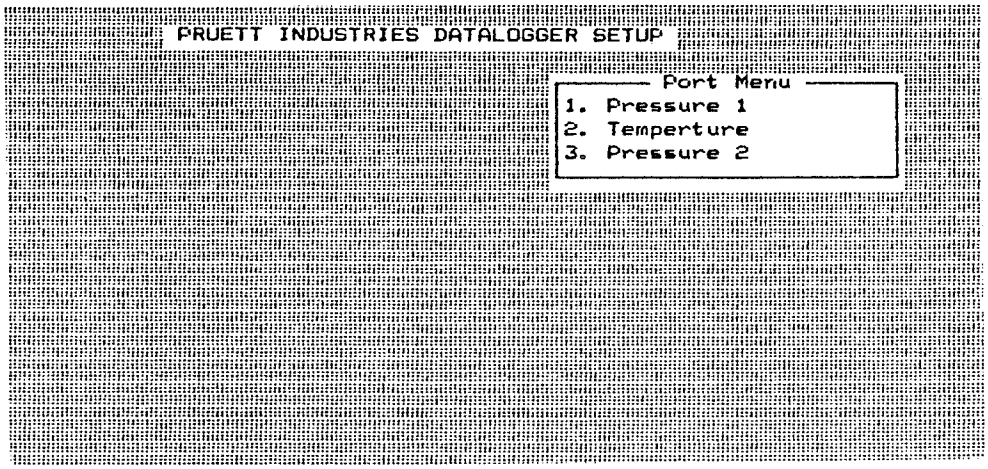
CAUTION: Always download the existing file from datalogger, before changing any file settings. The new settings will be stored and used for the next downloaded file.

----- CHANGE PORT SETTINGS-----

To begin the initial set-up for the datafile collection, choose:

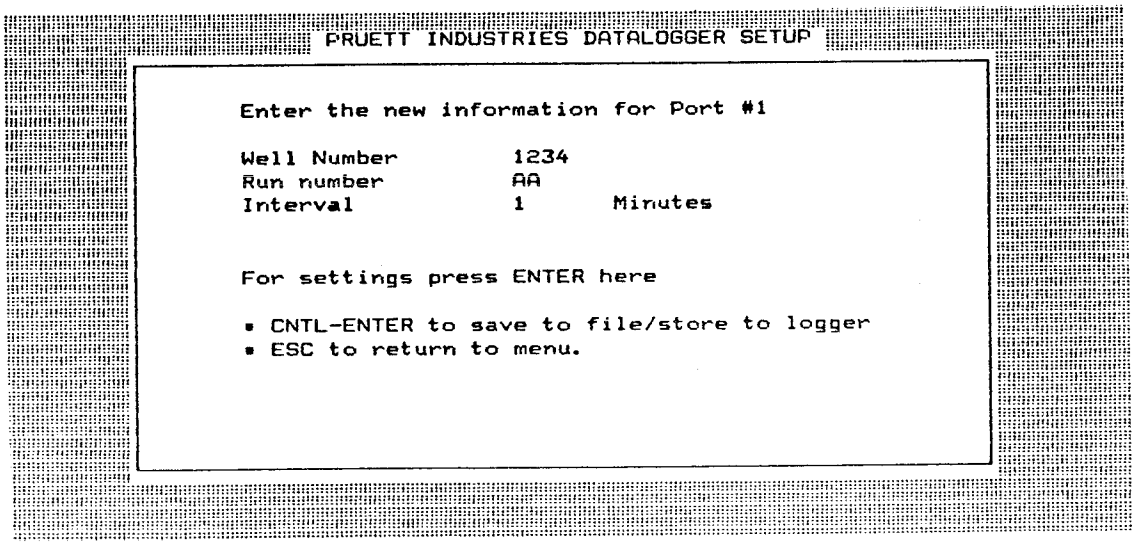
1. Change Port Settings

The screen below will appear:



Select the Port Number you wish to set up or change by moving the highlighted bar with your arrow keys or choosing the correct number and ENTER.

An example of the screen display for Port #1 is shown here:



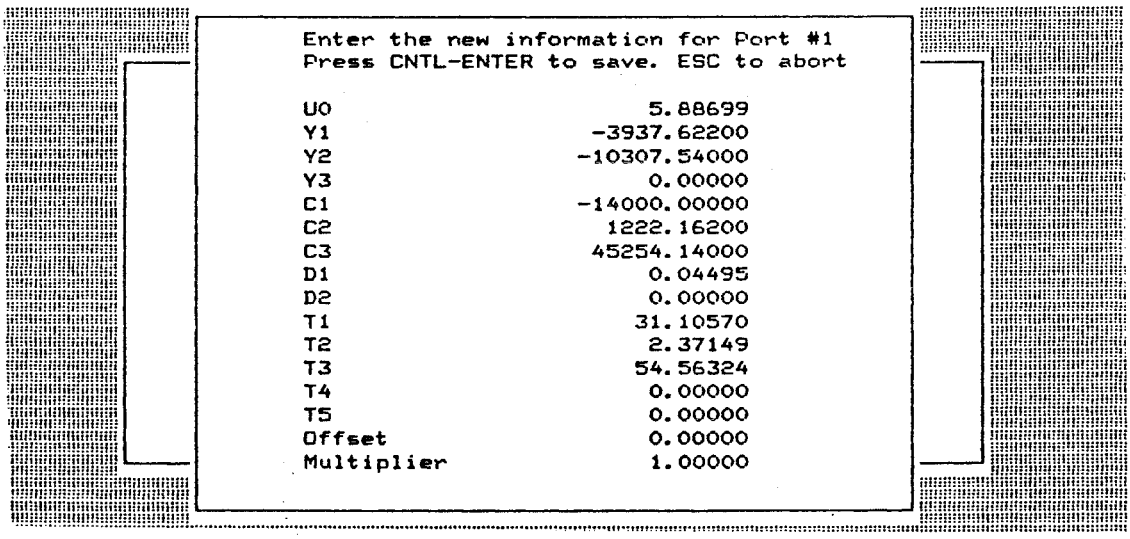
When beginning the initial set-up, there will be no information in the file. You must input the well name, run number and time interval (in minutes).

NOTE: The run number should be a 2 character indentification of the data file (such as 1A for the first file of port #1, 2A for the first file of port #2, etc.)

The time interval sets how often you wish data to be collected on the logger. If you want data every 2 hours, set the time interval for 120 minutes.

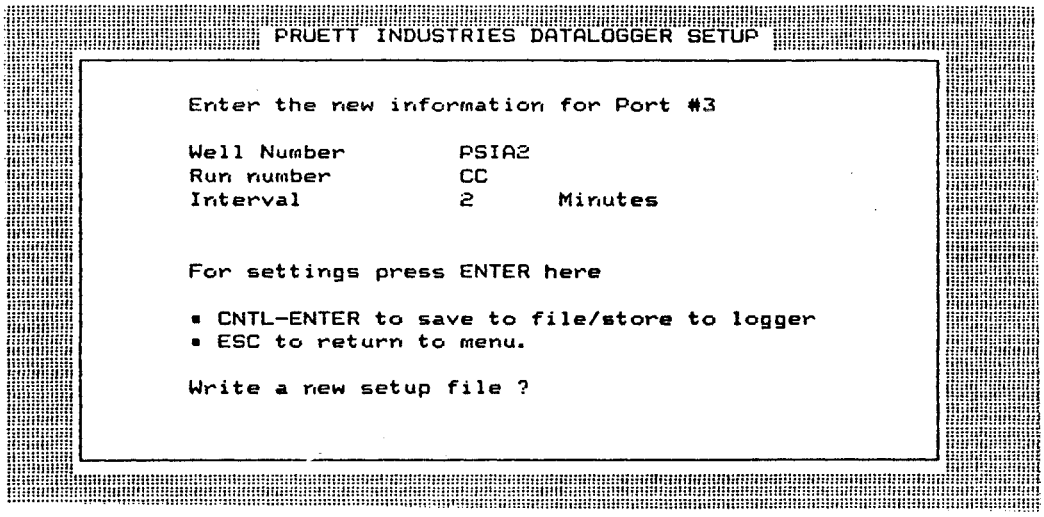
After setting up the first time, the information will be stored in an operations file, and you will only have to make a few changes, such as a new run number after, the each file has been downloaded.

To input the transducer information, press ENTER when the cursor is shown at the "settings" line. The next display will allow the user to input all transducer coefficients, an offset if needed, and a multiplier from the Cap Cal Program. NOTE: The temperature port will not display this screen--for pressure transducers only.



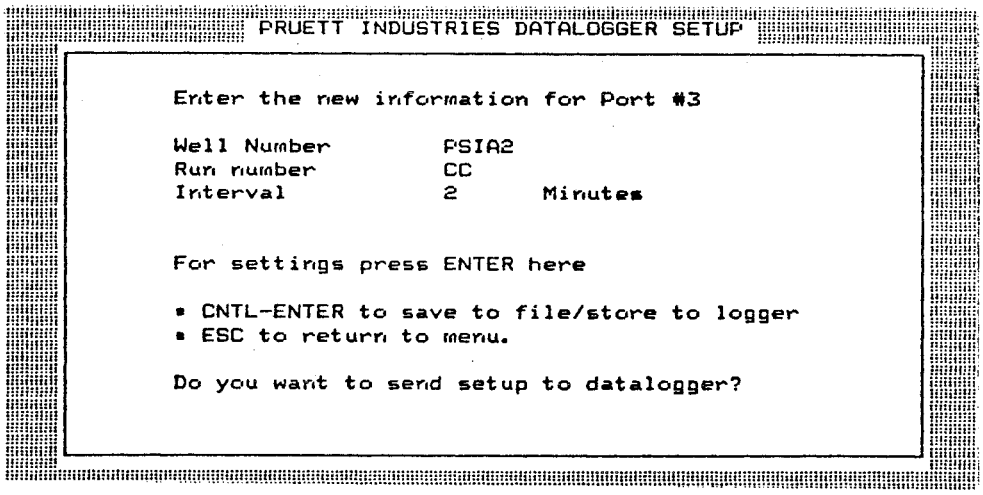
Answer each line of setting information, then press CNTL-ENTER to save. If you wish to review the settings and not make changes, abort by using the ESC key.

The program will return to the Port information screen, and you should again use CNTL-ENTER if you wish to save the new file settings you have entered. Input "Y" for yes or "N" for no. See sample below:



When saving a new set-up file, the well name, run number and time intervals are stored on disk to a special operations file.

Next the program asks "Do you want to send setup to datalogger?" See example below:

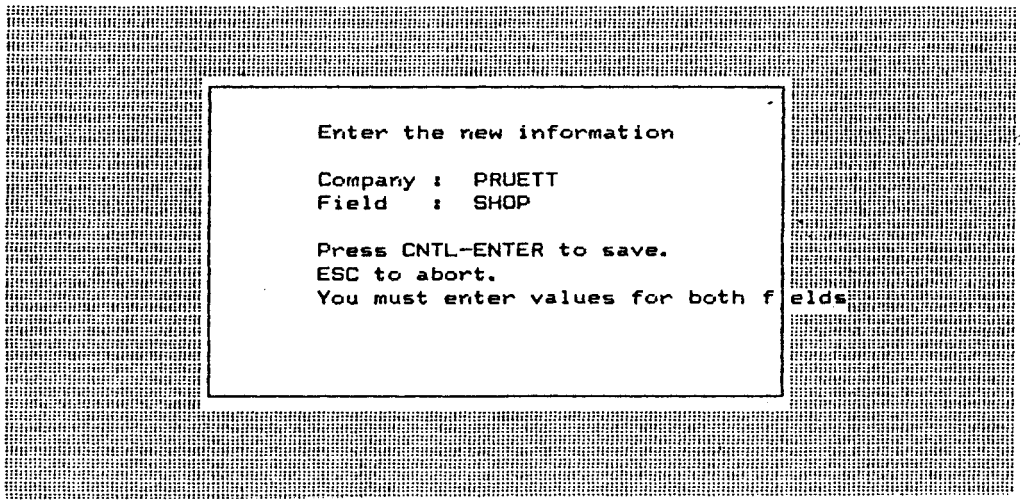


You may choose to send the new information to the datalogger now, OR WAIT, if you have other ports to enter or update. Again a "Y" for yes and "N" for no. It is easiest to enter the information to all ports, then save to the datalogger when the final port has been updated.

Use the ESC key to return to the main menu.

-----CHANGE COMPANY / FIELD-----

The #2 main menu option allows the user to enter the company and field name. This screen must always be completed during the initial set-up. Press CNTL-ENTER to save or ESC to abort the entry. Sample screen below:



-----DOWN LOAD DATA-----

Selection #3 from the main menu will allow the operator to gather the data collected by the logger, to the computer disk. As the file is being accessed from the datalogger, the following information will appear on the screen:

```
Warning -file type is not used

Calling Station "PRUETT"

*1A
 R+902.00 F+5298.0 V3 E00 00 M48 A1 L+902.00 C2450
*513G
 A1 L+513.00 C0938
*4F
385F
E
Next time for "PRUETT" is 10/20/89 13:04:00
Press a key to continue...
```

The " next time " statement shows the earliest time another file can be downloaded with the program--about 1 minute.

Press a key to continue... and the screen will display several lines of information as the data is being stored.

```
TERM: PRELIM     Com1:9600 baud        Datalogger Type: CR10
Option: Download PRUETT.DLD                      Esc = Abort Option

*
*2718H

>

MODE 13
13:00  2
02:(
Wait briefly.

220 bytes sent, received, entered.
220 bytes sent, received, entered.
220 bytes sent, received, entered.
220 bytes sent, received, entered.
220 bytes sent, received, entered.
220 bytes sent, received, entered.
220 bytes sent, received, entered.
220 bytes sent, received, entered.
220 bytes sent, received, entered.
58 bytes sent, received, entered.


Closing interfaces to station PRUETT.    Wait ...
*E
Datalogger has exited telecommunications.
```

The data has now been stored to your computer disk. If you were to look at the diskfile name at this time, it would be called PRUETT.DAT. The data in the file would look similar to the example below:

```
111,1989,293,1209,51.16,25.08,13.79
111,1989,293,1210,51.17,25.11,13.77
111,1989,293,1211,51.18,25.09,13.82
111,1989,293,1212,51.17,25.13,13.91
111,1989,293,1213,51.17,25.16,13.89
111,1989,293,1214,51.15,25.16,13.81
111,1989,293,1215,51.17,25.8,13.77
111,1989,293,1216,51.18,25.17,13.92
111,1989,293,1217,51.18,25.21,13.82
111,1989,293,1218,51.17,25.86,13.94
111,1989,293,1219,51.17,25.86,13.75
111,1989,293,1220,51.17,25.23,13.8
111,1989,293,1221,51.16,25.24,13.76
111,1989,293,1222,51.19,25.89,13.78
111,1989,293,1223,51.2,25.29,13.89
```

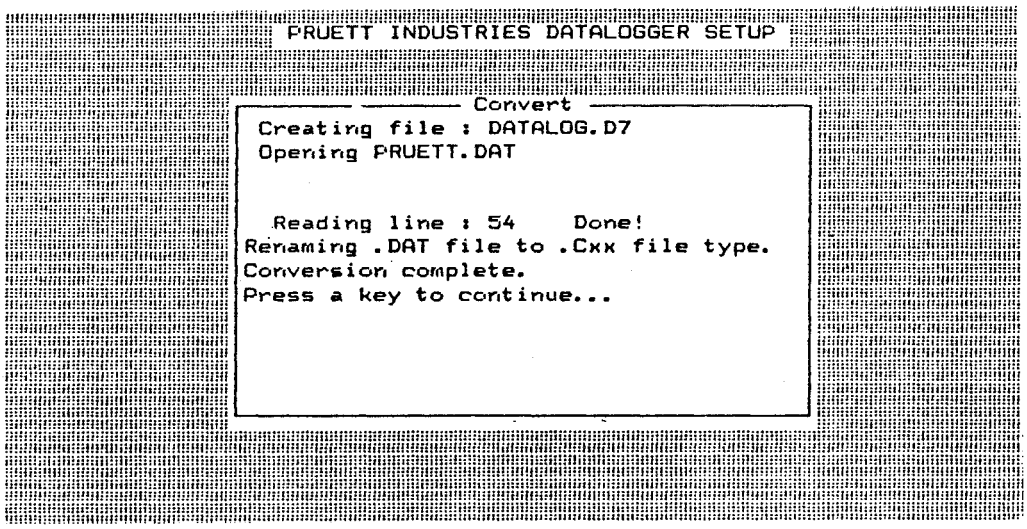
This file contains a log identifier, year, julian date, real time, press from port 1, temp from port 2, and press from port 3.

NOTE: When the equipment is ready to go into the field, after the bench test proceedure, be sure to DOWNLOAD and CONVERT the file from the datalogger BEFORE making any changes in the run number or other entries. Also delete the PRUETT.C1 and DATALOG.D1 from disk. The first field files will then begin in proper sequence.

-----CONVERT FILE FORMAT-----

Before the file can be accessed for plotting and printing, it must be changed to the correct file structure. #4 on the main menu "Convert File Format", will accomplish this.

The screen will display the following information when the file has been converted:



NOTE: The PRUETT.DAT file will now be named PRUETT.C1 and the converted file will be called DATALOG.D1. If several data files are stored to the same disk, each new file will be converted to the next number in sequence (ie. PRUETT.C2 DATALOG.D2 etc.).
Return to the main menu and -----

-----Select #5 from the main menu to exit the program.

Use the previous Pruett CONVERT, COMBINE, PLOT AND REPORT programs to process the "DATALOG" files.